

base they extend outwards, only very slightly, however; between the base and the middle there is a moderate sinuation; the posterior angles are rectangular; the dorsal groove almost reaches the apex and is quite distinct behind; the basal fossæ are very large, but become shallow near the central groove; the punctuation near the base is feeble, the plica near each side is well marked. *Elytra* oval, much broader than the thorax, the lateral margins and channels broad; their striæ, though distinct, are not deep nor broad, and they are only very finely punctured; the fifth is bordered behind by distinct carinæ; interstices broad, not convex, the third tri-punctate; at each side near the shoulder there are three or four setigerous punctures, there are similar ones behind.

There are two setigerous punctures on the *forehead* and one near the back part of each eye. The *antennæ* barely attain the middle thighs; their second joint is as long as the first, it is nearly glabrous; the third is nearly bare at the base. The *front tarsi* are narrow; their basal joint is shorter than the terminal one, the second is longer than broad; the third and fourth are cordiform, the latter is shorter than the former.

The nearest species is *Z. carinatus* (No. 1339). This is a little narrower, with a shorter thorax; its sides are more rounded at and before the middle and more sinuated behind; the basal impressions are larger, but the punctures there are much finer and less numerous; the last puncture on the third interstice is situated behind the posterior femur, in No. 1339 it is placed in line with the front of the thigh; the scutellar striolæ are represented by series of fine punctures; the apices of the elytra are more broadly rounded; the hind tarsi are feebly grooved above.

♀. Length $3\frac{5}{8}$, breadth $1\frac{3}{8}$ lines.

Wellington. I received my specimen from Mr. J. H. Lewis; he found it on the 2nd September, 1893.

[To be continued.]

MISCELLANEOUS.

A new instance of Commensalism: Association of Worms of the Genus Aspidosiphon with Madreporarian Polyps and a Bivalve Mollusk. By M. E.-L. BOUVIER.

IN their 'Monographie des Turbinolides,' published in 1848, Milne-Edwards and Jules Haime mentioned the association of Gastropod mollusks with Madreporarian polyps, which they subsequently assigned ('Histoire naturelle des Coralliaires,' t. ii. p. 51, 1857, and

t. iii. p. 63, 1860) to the genera *Heterocyathus*, *Heteropsammia*, and *Stephanoseris*. This phenomenon of commensalism likewise attracted the attention of Deshayes ('Catalogue des Mollusques de l'île de la Réunion,' p. 65, 1863), who considered the commensals of the polyps to be Gastropods with disunited whorls, and formed for them the genus *Cryptobia* in the family Vermetidæ. Deshayes gives a precise description of the respiratory perforations which traverse the skeleton of the polyps, to terminate at the body of their host; he observes, moreover, that the shell of the mollusk persists as far as the external orifice in *Heteropsammia*, but not in *Heterocyathus*, that its disunited whorls have not the smooth and glossy surface possessed by those which remain in contiguity, and, finally, that there is reason to attribute this difference to a "progressive dissolution of the skeletal matter of the coral, the pores of which would have been filled up by the mollusk."

Thanks to the rich material which Dr. Jousseume collected at Aden, and very kindly handed over to me, I have been able to renew the study of this question, and have arrived at the following curious results:—

The polyps belonging to the genera *Heterocyathus* and *Heteropsammia* attach themselves, probably on emerging from the embryonic stage, to the *empty* but always very small shells of various Gastropods; as soon as they have become fixed they receive as commensals young Gephyreans of the genus *Aspidosiphon*, which take up their abode in the cavity of the shell and coil themselves into a corresponding spiral. The two commensals then develop simultaneously—the polyp spreading more and more over the shell, which it completely covers, and finally extends beyond; the worm growing on its part in the shape of a spiral with disunited coils, and producing in the calcareous tissue of the polyp a cavity of the same shape, which prolongs that of the shell and opens to the exterior by a rounded orifice.

Simultaneously with the growth of the polyp and its host the latter *secretes a tube* in prolongation of that of the shell, but differing from it by being less thick, by its intimate union with the skeleton of the coral, as also by the aspect of its internal surface, which is neither smooth nor lustrous like that of the shell: in *Heteropsammia* the tube thus formed extends in the majority of cases to the external orifice; in *Heterocyathus*, on the other hand, it develops more slowly, and does not reach this aperture. In order to keep itself in direct communication with the respirable medium, the worm dissolves the surrounding calcareous elements, following certain lines normal to its surface, and thus gives rise to linear perforations which serve for the entry and exit of the ambient water. The formation of air-holes of this description is doubtless due to the solvent action exerted upon the calcareous matter by the secretion of certain cutaneous glands.

The worms commensal with the polyps are provided with a long extensile proboscis and two solid shields, formed by the juxtaposition of corneous pieces. The proboscis terminates in a peribuccal wreath

of short tentacles, and exhibits upon its surface a number of transverse rows of pointed hooks; it is a prehensile organ employed by the animal to capture its prey; but it also serves, thanks to its hooks, for the locomotion of the two commensals, for M. Jousseau has seen it protruded by the worm and applied to the bottom, as if to find a point of support, and then contracted so as to drag the polyp along. The shields are two in number, as in all the species of the genus *Aspidosiphon*: the first is grooved with transverse striations in front and longitudinal striations behind, and is situated at the base of the proboscis, near the anus; the second occupies the posterior extremity of the worm, and is circular in shape, with radial grooves. I know not what is the rôle of this latter, but the anal shield closes the orifice of the tube when the animal is retracted, and consequently acts as a defensive operculum.

These worms belong to two new species, one of which inhabits *Heteropsammia* and the other *Heterocyathus*. The former greatly resembles *Aspidosiphon mirabilis*, Théel, from the Swedish seas, but differs from it by reason of its habitat, in the shape of its nephridia, and in the number of the coils in its digestive tract; the latter is allied to a Malayan species, *Aspidosiphon ravus*, Sluiter, from which it is readily distinguished by the grooves in its shields. Since Deshayes has proposed for the Gastropods which he believed to be commensal with the two polyps the names *Cryptobia heteropsammiarum* and *C. Michelini*, it will be well to designate the Gephyrean of *Heteropsammia* *Aspidosiphon heteropsammiarum*, and that of *Heterocyathus* *A. Michelini*.

The commensalism of the *Aspidosiphon* is complicated, at least in the case of *A. Michelini*, by the presence of the young of a very small Lamellibranch mollusk (*Kellia Deshayesi*, Jousseau, sp. n.), which takes up its abode in the cavity inhabited by the worm, and shelters itself in the depressions in the surface of the latter; when the commensals are adult the number of these bivalves amounts to about a dozen. They derive their sustenance from the current of water which passes into the interior of the spiral cavity through the linear perforations of the polyps.

We may sum up our results as follows:—(1) The commensal of *Heteropsammia* and *Heterocyathus* is a worm of the genus *Aspidosiphon*, and not a Gastropod; (2) each polyp has its particular species, and develops concurrently with it; (3) the polyps attach themselves to various shells, and not to those of a distinct genus; (4) the rugose tube by which the shells are continued does not belong to their substance, but is formed by the worm; (5) the association of the worm and the polyp is complicated, at least in the case of *Heterocyathus*, by the presence of a third commensal in the shape of a bivalve mollusk.

Setting aside this latter animal, the commensalism of *Aspidosiphon* with the polyps reminds us in every respect of that of *Parapagurus pilosimanus* with the colonies of *Epizoanthus*.—*Comptes Rendus*, t. cxix. no. 1 (July 2, 1894), pp. 96–98.